DOCUMENT RESUME

ED 315 168 PS 018 558

AUTHOR Horowitz, Frances Degen
TITLE The Concept of Risk: A Re-evaluation.
PUB DATE Apr 89
NOTE 37p.; Paper presented at the National Biennial Meeting of the Society for Research in Child Development (Kansas City, MO, April 27-30, 1989).
PUB TYPE Speeches/Conference Papers (150) -- Information Analyses (070)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *At Risk Persons; Behavior Problems; Etiology; Guidelines; *Individual Development; Infants; *Models; *Prediction; Psychopathology; *Research Design; *Risk
IDENTIFIERS Developmental Psychopathology; Life Span Development; Theoretical Analysis; *Theoretic Orientation; *Transactional Theory; Universality

ABSTRACT

A substantial body of data and a number of reviews of the literature on risk encouraged this attempt to construct a theoretically consistent approach to research on risk. Much of the research can be seen as attempting to estimate the probability that development will be compromised for groups of infants born under different circumstances. Linear models have been replaced by the transactional model, which promotes the use of multiple regression techniques to evaluate large data sets involving numerous variables. More needs to be known about the transactional model if fruitful hypotheses are to be formulated about it. Nevertheless, when it comes to developmental outcome in at-risk children, researchers suspect that a great amount of residual variance can be accounted for by transactional dynamics. This paper: (1) explores dynamics and elements in residual variance; (2) suggests an approach to research on risk that promises significant gains in understanding of determinants of normal and abnormal developmental outcomes for at-risk infants; (3) considers the proposition that the concept of risk is useful at each nodal point of developmental change; and (4) advances the notion that the idea of being at risk should encompass not only the risk for downside development, but also the risk that potentially gifted and talented individuals will fail to achieve their developmental potential. Forty-six references are cited. (RH)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED315168

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
X This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy

Invited Address
Society for Research
in Child Development

April 1989
Kansas City, Missouri

The Concept of Risk: A Re-evaluation

Frances Degen Horowitz

The University of Kansas

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Frances Degen Horowitz
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Risk, at-risk, high risk, vulnerable, resilient, developmentally delayed, stress, coping, adaptive, biological risk, social risk, premature birth, low birthweight, small for dates, small for gestational age, disadvantaged, low SES..... these are entries in the lexicon that encompass the activities of many members of this Society. These are terms that describe the focus of interest of large numbers of psychologists, pediatricians, psychiatrists, social workers, and therapists of all kinds. These are the rubrics under which we do research and the populations for which numerous services and interventions are devised - not the least of which are a variety of early stimulation programs designed to prevent subsequent developmental problems.

PS 018558

Are the terms synonymous, overlapping, mutually exclusive? Are these terms that forshadow developmental prognosis? Do these terms or some subset of them reflect consistency with respect to an underlying theoretical orientation? The answer is yes and no to all of the above. Sometimes the terms are synonymous, sometimes overlapping and sometimes mutually exclusive. They do and do not forshadow developmental prognosis. Subsets are used consistently sometimes, other times not. Such is the condition of risk research; such is the result of a relatively productive period of research fueled by concerns for risk conditions and subsequent developmental outcome.

BEST COPY AVAILABLE

There is now a substantial body of data and a number of reviews and evaluations of the literature on risk (e.g. Kopp, 1987; Rutter, 1987; Kazdin, 1989; Newcomb and Bentler, 1989). This permits us to take stock, to assess and to attempt a theoretically consistent approach to research on risk and developmental outcome.

Current Perspectives on Risk

It is almost 15 years since Sameroff and Chandler (1975) published their seminal article delineating the "continuum of reproductive casualty." After reviewing the literature the concluded that there is an interaction of biological/medical conditions and the environment such that the environment serves to mediate the effects of adverse prenatal and perinatal conditions on subsequent developmental outcome. It is also almost 15 years since Lubchenco (1976) published her seminal volume on The High Risk Infant giving form to the basic classification of newborn infants into risk groups. These two publications, however, were not de novo attempts to address infants at risk. Rather, they can be seen as important punctuation marks in a corpus of work pertaining to the at-risk or high-risk infant, work that goes back more than 100 years (See Kopp, 1983, 1990 and Kopp and Krakow, 1983; Kopp and Kaler, 1989).

Part of what has driven the different epochs of interest in the high-risk infant have been changing technologies and medical practices pushing back the point of viability for the prematurely born infant and increasing survival rates for infants that would not have, in the past, survived. We now have categories for the very low birthweight infant (VLBW) born at 1500 grams or below and the low birthweight infant (LBW) born at 2500 grams or below down to 1500 grams. With the survival of smaller and smaller babies there has been increased concern for the implications for morbidity. While

mortality rates are easily documented this is not the case for morbidity since the definition and identification of morbidity ranges from clear-cut cases of profound and severe retardation or cerebral palsy or handicap to more subtle sequalae in the areas of motor control, learning, minimal brain dysfunction and developmental delay.

Morbidity rates, however, are only one of several problems in sorting out this area of risk and high risk. Risk, as many in the field have noted, is, in its essence, a probabilistic concept. For example, Kopp and Kaler characterized developmental risk as a "statistical probability that ongoing development will be compromised." (Kopp and Kaler, 1983 p. 224). Much of risk research can be seen as attempts to estimate that probability for different groups of infants born under and into different circumstances using a variety of markers or indices that will enable better prediction of subsequent developmental compromise.

Single events, unless resulting in massive and irreversible organic damage and dysfunction are rarely predictive of developmental outcome. In recognition of this a variety of cumulative risk score schemes have been attempted. When they have included only the number and severity of prenatal, perinatal and postnatal medical factors they have not been particularly successful. Adding socioeconomic variables and performance on early infant tests have increased their utility (Holmes, Reich and Pasternak, 1984). But not all that much. In fact, in most studies with significant results the predictive power typically involves significant correlations in the range of .30 to .50. Correlations such as these have been called "nature's favourite correlation coefficient" (Clarke and Clarke, 1988), indicating some consistency over time but leaving more than half the variance unaccounted for and therefore considerable inconsistency. In other words, more changes than stays the same. So much for making prognoses for

individual infants considered to be at-risk for developmental problems given our present strategies.

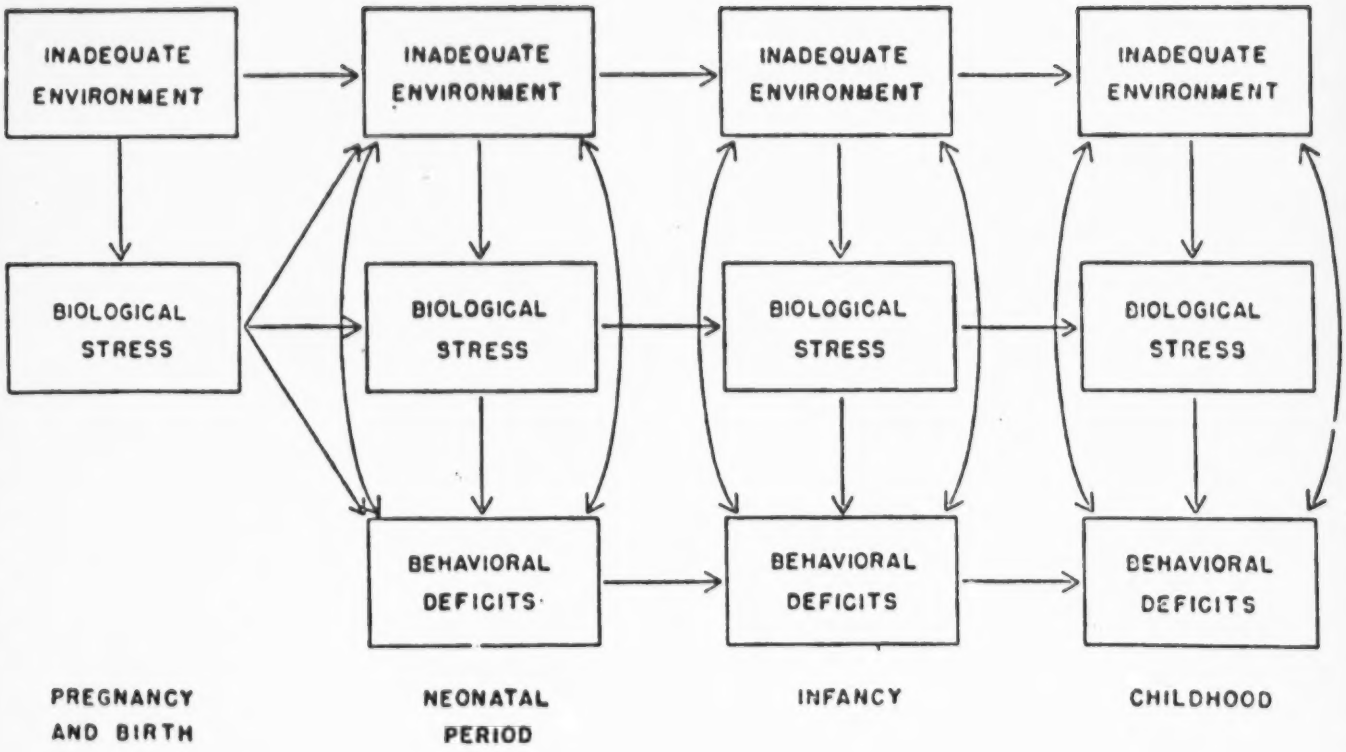
Few would maintain any longer that it is possible to make a useful linear prediction on developmental outcome using early measures. We learned a number of years ago that infant IQ was not predictive of later IQ. Though the recent developments in infant visual preference are being touted as the new infant intelligence test predictive of later child intelligence, in fact, the correlation coefficients for this assessment are, on the average, generally no higher than those obtained between parental education and child IQ (McCall, 1990). The major promise of the techniques evaluating infant visual information processing behavior is that they may ultimately tell us some interesting and important things about process in the development of intelligence and cognition and the role of individual differences in these systems. These techniques are important windows into the information processing behavior thought to be critical in early intellectual and cognitive development.

Eschewing linear models, the favorite substitute candidate for a model system is the transactional model. Sameroff and Chandler sounded this as a clarion call in their 1975 article and many others have followed suit. For example, here is a graphic model of transactional systems that Holmes, Reich and Pasternak (1984) used in concluding their discussion of the development of infants born at risk. Their depiction is shown in Figure 1.

Insert Figure 1 about here

In our research on the development of normal and preterm infants, healthy

FIGURE 1



A transactional model of development.

and sick, we, too, have adopted a transactional model. Its slightly more complex form is shown in Figure 2.

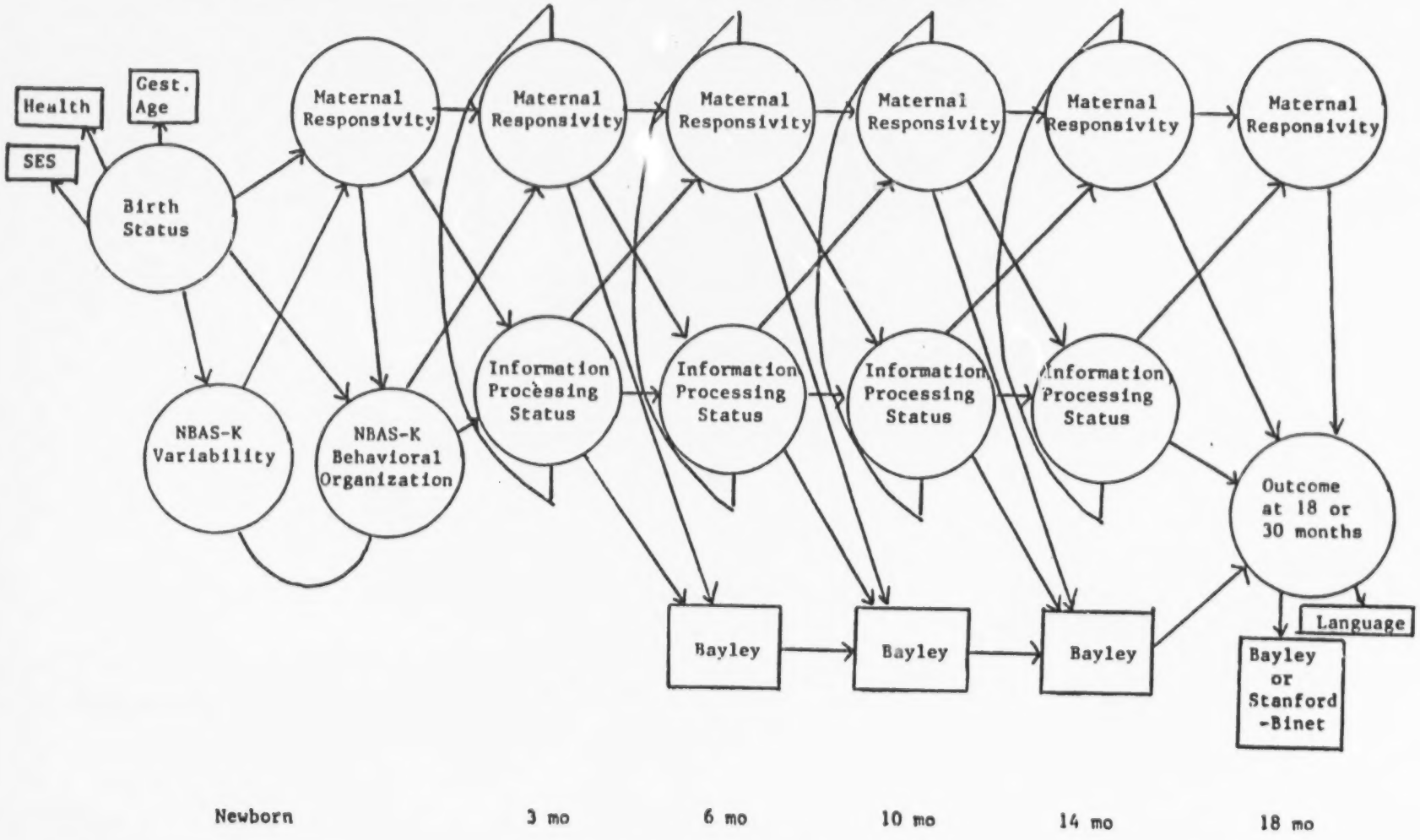
Insert Figure 2 about here

The transactional model, however diagrammed, involves the set of assumptions originally described by Sameroff and Chandler (1975). Namely, that the organism affects the environment and the environment affects the organism and out of these mutual influences development proceeds. Variations on the theme represent more or less refinements of this basic premise. For example, observations that the child's effect on the environment may be stronger at the extremes of the distribution of child intellect or temperament (Clarke and Clarke, 1988) - a not unreasonable proposal.

Obviously, models and theories of development are only as useful as the testable hypotheses they permit us to derive. Has the transactional model been a source of such hypotheses? There has probably been more talk and discussion of the efficacy of such a model for molding our thinking about development than direct tests of hypotheses derived from the model. On the other hand, the ideas inherent in a transactional model have had a significant impact on shaping developmental and risk research to encompass interacting sets of variables (e.g. Garmezy, Masten and Tellegen, 1984; Belsky, 1984). The environmental contributions of variables associated with family and extra-family support systems have become important in the discussion of risk, especially with respect to programs of intervention (e.g. Schorr, 1988). The popularity of multiple regression techniques to evaluate large data sets involving numerous variables can be seen as a direct outgrowth of the influence of the transactional model as well as the

Figure 2

A diagrammatic representation of the process model to be tested in the proposed research. Variables in circles represent constructs whose components are listed on the attached sheet.



FROM KID PROJECT
UNIVERSITY OF KANSAS

result of the development and availability of the appropriate statistical tools - not to mention, in addition, the technological advances in computational resources and on-line data entry capabilities.

There has also been an increased focus upon organism/environment interactions - especially mother-infant, mother-child and adult-child interactions (e.g. Emde, et al., 1978; Field, 1987; Parrinello and Ruff, 1988; Rogoff, In Press; Wahler and Dumas, 1989). Most of the efforts, however, fall far short of fully encompassing a transactional approach - partly because getting a handle on the totality of a transactional system is expensive. In the meantime considerable research has also been done looking at single risk variables and studying the effect of a given variable on specific behavior (e.g. Bettes, 1988). This has been quite useful even if not in a transactional framework. We need to know more about the constituent components of a transactional system than we do now in order to formulate complex and fruitful hypotheses based on a transactional model.

Nevertheless when it comes to understanding developmental outcome in at-risk children, everyone suspects that a great hunk of the variance (after the variance accounted for by "nature's favorite correlation coefficients") is tied up in the transactional dynamics that result in some children overcoming the risk factors and showing good or excellent development while others succumb to lower levels of developmental achievements. For the remainder of the time I have here today I want to explore the possible dynamics and elements in that currently unaccounted for portion of the variance. In doing this I will suggest an approach to risk research that I believe would enable us to make significant gains in our understanding of what determines whether or not infants born at-risk for normal development attain normal development. I will also consider the proposition that the

concept of risk has utility at each nodal point of developmental change. Finally, I wish to advance the idea that being at-risk is a concept that should not only encompass risk for downside development but should also encompass risk for not achieving the significant upside of development for those individuals who have the potential for developmental outcomes regarded as gifted and talented. This has been referred to a "at promise."

A Theoretical Orientation

In re-evaluating the concept of risk and how we employ it in developmentally oriented research there is time here today only to sketch out the basic elements and to leave the elaboration of the position being expressed to a longer, written exposition. The basic elements involve the nature of the human behavioral repertoire, the presence of individual differences in the human organism, the functioning of environments on a continuum of developmental facilitation, and the possible existence of nodal developmental points that involve a change in the equation determining developmental outcome.

Universals and Non-Universals in the Human Behavioral Repertoire

As I have discussed elsewhere (Horowitz, 1987), I believe that it is useful to consider the human behavioral repertoire in terms of its universal characteristics and its non-universal characteristics. This has particular relevance to the concept of risk. The distinctions between Universal and non-Universal Behaviors and the relation to different behavioral systems and risk are shown in Figure 3.

Insert Figure 3 about here

The human behavioral repertoire in this figure is dichotomized in terms of its Universal and non-Universal components. The Universal components are those aspects of the human behavioral repertoire that have a very high probability of acquisition in all normal human organisms and in many with some abnormalities and problems. While these behaviors may be "learned", the conditions that account for the learning are so ubiquitous and in overabundance everywhere in the environment - unless the environment is severely abnormal - that the acquisition of these "basic forms" is inevitable. Kopp (1987) commented on this with respect to infants when she said "With the exception of the most severe risks, fundamental forms and sequences of early infancy behavior are not modified by adverse influences, although...." developmental rate may be affected. (Kopp, 1987, p. 882.)

There are, however a number of qualifications that must be made to this kind of general statement about the Universal behavioral repertoire of the human species. They relate to periods beyond infancy and also to specific behavioral systems. A number of the qualifications are shown in Figure 3. They involve qualifications in terms of whether one is focusing upon the motor system, cognition and language or the social/emotional/personality system. The degree to which there are basic universal forms in each of these systems differs as does the controlling strength of genetic determinants and the role of cultural transmission. As David Feldman (1980) has suggested, some presently Universal behaviors such as the concept of number may well be in the human repertoire as a function of universal cultural transmission. Further, I believe that cultural transmission helps to "sculpt" the relative strength of behaviors in the universal repertoire -

Universal and Non-Universal Behaviors and Developmental Risk

Behavioral System	Motor	Cognition/ Language	Social/ Emotional	Determinants of Risk
UNIVERSAL Probability of acquisition high, conditions for learning minimal; basic disturbance organic in origin; rate more likely affected than form.	Basic forms highly determined Evolutionarily the oldest system Strong genetic basis	Basic forms range from highly to Moderate genetic components with exceptions Cultural Transmission important for relative sculpting of this system	Fewer basic forms and more moderately determined Moderate genetic components with exceptions Cultural Transmission critical Evolutionarily the the youngest system(?)	Initially determined by compromise in biological/ organismic factors
NON-UNIVERSAL Probability of acquisition strongly determined by conditions for learning. Interference with acquisition can be organic in origin, environmental in origin or both.	Highly determined by environment - including cultural transmission Universal repertoire unconditional basis for acquisition of non-universal repertoire	Strong reliance on environmental - cultural transmission vary Multiple paths to same end points Many optional end points Organismic contributions moderate(?)	Critical reliance on environmental social factors Cultural transmission critical Organismic contributions strong(?)	Initially determined by organism interacting with environmental/ social factors unless critical element of the Universal repertoire is biologically compromised

Figure 3

some cultures emphasizing some of the basic forms over others.

The older the behavioral system in evolutionary terms, the more rigid the basic forms of the system. Thus, the motor system is depicted as the oldest behavioral system of the species, with the social/emotional system as the youngest though one might argue about some elements of the emotional system as perhaps being among the older parts of the species in evolutionary terms.

The organization of the human behavioral repertoire in terms of the three systems shown - motor, cognition and language, social/emotional/personality - is somewhat arbitrary since not all aspects of each of these systems are discrete. However, for the sake of argument they are so shown here.

The last column of Figure 3 lists the determinants of risk. The Universal behavioral repertoire is subject to developmental risk due to organic compromise. This can be the result of genetic factors and also because of internal or external agents that affect biological function. Such effects are most likely seen in slowing the rate of development of the basic forms of the Universal behaviors rather than altering the basic forms themselves though there are genetic, biochemical and structural conditions that can affect the basic forms. Further, different critical factors, including genes can turn-on at different points in time for different domains. There do not appear to be many constant sources of genetic influence (Thompson, In Press) across time and across domains.

The Universal behavioral repertoire in each system provides the basis upon which the non-Universal repertoire can be acquired. The non-Universal behaviors are heavily dependent upon environmental facilitation and conditions that permit learning to occur. These learning conditions are

less ubiquitous and more under the control of the particular social and physical constellations of different environments. They are relatively more reliant upon mechanisms of cultural transmission and more easily influenced by variations in environment. However, this is different in different domains. For example, as Field (1987) has noted, it may be easier for an individual to compensate for lack of socially provided stimulation in the cognitive domain than in the social/affective domain.

The non-Universal behavioral repertoires in each of the systems have few final end points, evolve across the life span and involve a large variety of forms. The influence of genetic components is weaker in the non-Universal repertoires as compared to the Universal repertoires though the degree of organismic predispositions, partially influenced by genetic inheritance, may differ across the behavioral systems.

Risk is more culturally defined with respect to the non-Universal behavioral repertoire than is true for the Universal behavioral repertoire. For example, the inability to learn to read and write will never surface as a predicted consequence of risk conditions in a non-literate society.

The initial determinants of risk in affecting the non-Universal behavioral repertoire involve the organism interacting with environmental factors. This assumes the critical forms of the universal repertoire are not biologically compromised. However, organismically based individual differences are strong contributors to the interaction with the environment.

Some concrete examples will be useful in seeing the kinds of clarifications that are possible if the matrix shown in Figure 3 serves as a template for thinking about developmental risk. A child born prematurely without obvious organic compromise and who traverses the postnatal period without complication is probably not highly at risk in the developmental aspects of the Universal behavioral repertoire. Depending upon the nature

of the socially mediated environment that provides the infant's care, the non-Universal behavioral repertoire may or may not be at risk. If the infant is "difficult" in the sense of crying a lot, less responsive to social initiatives, and hard to console, the nature of the environment may become critical. If the caregivers cannot adjust effectively to these characteristics the result may be an environment that becomes a risk factor because it does not provide the conditions necessary for the acquisition of the non-Universal behavioral as fully or as well as expected according to the cultural norms of the environment in which that child will have to function.

The notion of "double disadvantage" has been advanced by a number of investigators in the high-risk research area (Rutter, 1987; Bateson & Hinde, 1987; Escalona, 1982). The presence of biological risk and social risk factors compounds the situation for developmental outcome. However, I believe we will find that double disadvantaged does not operate evenly across the behavioral repertoire. The optimal and threshold organism/environment conditions, especially with respect to the non-Universal behavioral repertoire are particular to behavioral system as well as to the period of development during which they obtain. Initially, some high-risk infants may have a generalized abnormally high or abnormally low threshhold to stimulation in the cognitive and affective domains (Field, 1987) but often these general characteristics will settle out to affect some domains more than others.

In many instances of biological and for most instances of social risk conditions, the Universal aspects of gross motor development in infancy will not be affected except perhaps in rate of development. Most of what develops in the motor system during infancy involves the Universal

behavioral repertoire of sitting, standing, walking, etc. The non-Universal aspects of gross motor behavior are not prevalent during this period and therefore not likely to be affected by conditions that obtain during the earliest years. On the other hand, with cognition and language it is different. There is a strong developmental trajectory involving the basic Universal forms in language and cognition during infancy. But there is, also, the development of the non-Universal aspects as a function of particular environments and cultures. Some components of cognitive and linguistic behavior are more strongly valued in some cultures and environments than others. These will be responded to and with greater or lesser elaboration on the basic forms. The claim, therefore, that the infancy period is "buffered" and unlikely to be perturbed especially by social risk factors may only be relevant to the Universal components of the behavioral repertoire and not the non-Universal ones many of which have their initiation during infancy.

In the social/emotional system the nature of the Universal repertoire may be less extensive than for the other systems though the initial organizing element of state control may be quite pervasive and may significantly influence early development in cognition and language. The early Universal forms of social and emotional behavior can be compromised by organic factors but this compromise may work its effect largely through state and state modulation. State factors may also affect cognition and language development - especially as they introduce individual difference elements that affect information processing. (e.g. see Moss, et al., 1988). Thoman's identification of state inconsistency as a risk indicator for later developmental dysfunction lends support to considering early state organization as an important individual difference variable in developmental process (Thoman et al., 1981). Large portions of the social repertoire are

non-Universal. Putting the social repertoire at risk may be heavily determined by environmental factors interacting with organismic dispositions, with state organization an early indicator of some of those dispositions.

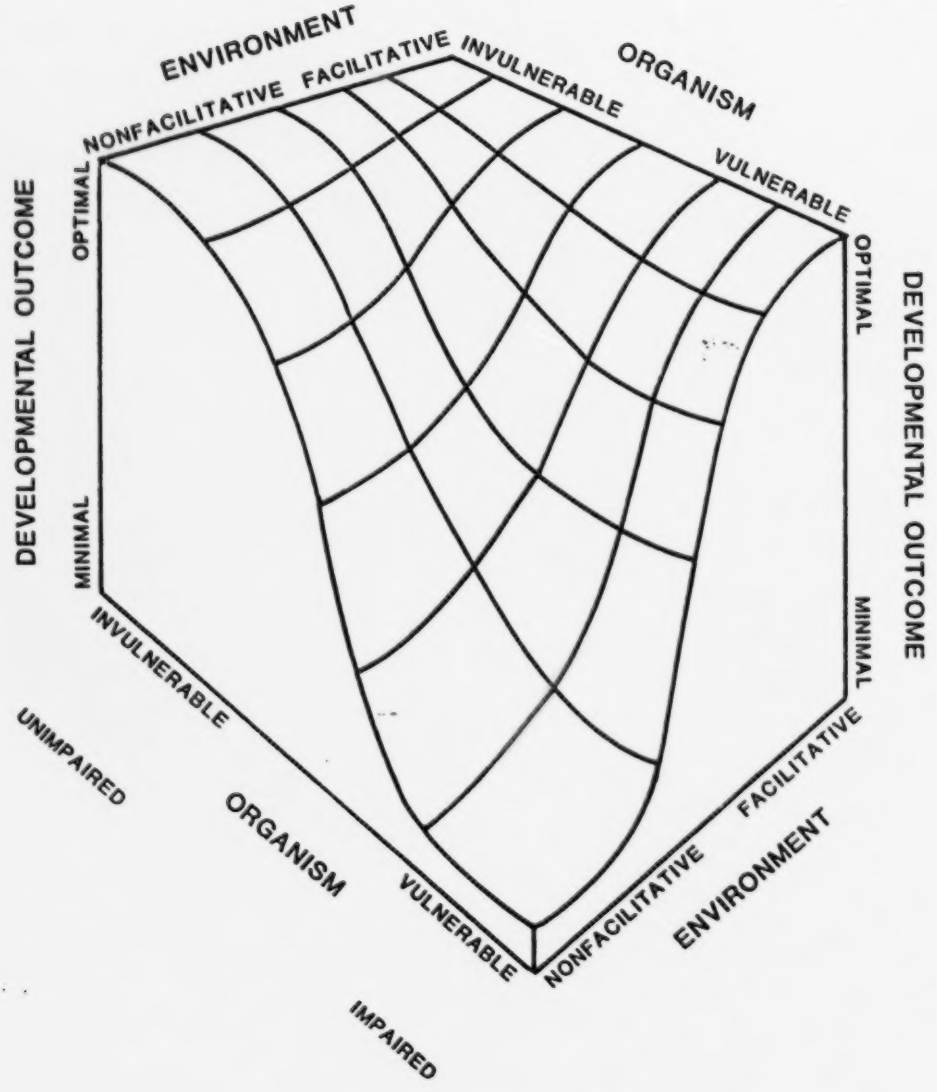
Individual/Environment Interactions

Further qualifications related to organism/environment interaction must be considered. This is at the heart of the "transactional" model where the organism and environment are depicted as mutually influencing systems whereby the organism modifies the environment and the environment modifies the organism. I believe that the transactional model is more particularly useful to thinking about the development of the non-Universal behavioral repertoire than to thinking about the development of the Universal behavioral repertoire except with respect to the rate of development of the Universal behavioral repertoire. Further, I believe that the notion of mutual influence needs refinement along a continuum of organismic and environmental characteristics. The model shown in Figure 4 can be used for this purpose.

Insert Figure 4 about here

This model was first developed as a heuristic in thinking about individual differences (Horowitz, 1978). Subsequently, it was used to elaborate the nature of the interactions that determine developmental outcome in high-risk infants (Horowitz, 1984). More recently, referring to it as a Structural/Behavioral model of development, it has been used as the basis for showing that both organismic and behavioristic theories of

FIGURE 4



From Horowitz, 1987.

development need to be used in accounting for behavioral development and behavioral outcome (Horowitz, 1987).

In this model risk can be a function of either organismic or environmental characteristics or both. It incorporates the notion of degree of physical impairment as well as a continuum of organismic vulnerability or resilience. The physical impairment can have a genetic basis and/or an environmental basis as a function of accident, infection or insult with a resulting biological compromise. Similarly, resilience and vulnerability can also have a genetic basis and/or an experiential basis affecting learning that influences coping strategies, information processing behaviors, etc.

The environment is ranged on a theoretical continuum of facilitative of development to non-facilitative but the mutual influence of environment and organism may be attenuated at various interactive combinations. The facilitative environment can enhance the rate of development of Universal behaviors in a child who is organismically compromised. For example, early stimulation programs for Down syndrome infants have been demonstrated as affecting developmental rate in the areas of motor, cognitive and language development. The non-Universal behavioral repertoire can also be affected though organic impairment, given our present technology for intervention, can put a ceiling on the non-Universal behavioral repertoire so that reaching normal or excellent cognitive development (and thus finding a place at the middle or upper quadrant of the surface of the Structural/Behavioral model shown in Figure 4) is currently not an achieveable goal for these children.

The combinations and permutations possible using the Structural/Behavioral model are extensive. The individual differences that

the organism brings to the interaction with the environment may modify or not modify the environment and vice-versa. Environmental modification will be less critical for the development of the Universal behavioral repertoire. The surface of the model is a graphic representation of developmental risk, assuming the middle portion of the sloping surface represents normal development, the upper far quadrant excellent development, the lower near quadrant very poor development.

In risk populations we normally focus upon movement from the normal range downward to the model's lower quadrant of the developmental outcome surface. However, the notion of risk is equally applicable to lack of movement in the opposite direction wherein conditions could obtain to produce a very high level of developmental outcome but do not. Admittedly, we know less about this kind of "loss of potential" than when developmental progress is below normal. Still, the loss of human resources is no less serious. From society's point of view the loss of gifted development may be a more critical loss than the loss of potential in retardation. Giftedness is, almost by definition, a realization of advanced or different functioning in the non-Universal behavioral repertoire. It is likely put at risk more by environmental and social factors though biological elements enter which compromise or make more difficult the attainment of gifted functioning as in the case of learning disabled gifted children.

The Developmental Focus of the Risk Literatures

It will be useful to briefly review the nature of the extant risk literatures to identify the different foci and the different terminologies as well as the different emphases upon developmental periods. There are at least five, maybe more, bodies of these literatures relevant to our

discussion today. Table 1 identifies them: The high-risk infant

---

Insert Table 1 about here

---

literature; the conduct disorder literature; the literature on the effects of behavioral teratogens; the research on developmental psychopathology; and, finally the sensitive periods literature.

The high-risk infant literature uses the terms of risk, high-risk and at-risk. More recently the distinction between infants at biological risk and infants at social risk has been emphasized. The outcome indices have been heavily dominated by cognitive and intellectual measures (e.g. Bradley, et al., 1989; Escalona, 1982; Kopp, 1983; 1990; Kopp and Kaler, 1989; Kopp and Krakow, 1983; Horowitz, 1984; Hoy, Bill and Sykes, 1988; Korner, 1987; Streissguth, et al., 1989). In this literature there has been a strong concentration of research on infants born prematurely as well as infants born following a variety of risk conditions associated with the prenatal period (e.g. Greenberg and Crnic, 1988; Riese, 1988; Rose, et al., 1988). There has also been a particular interest in infants with known handicapping conditions and in the efficacy of intervention programs for these children (Ramey and Trohanis, 1982).

The second literature relates to what has been variously called delinquency, social conduct disorder and social deviance. In this literature the focus tends to be upon the period of middle childhood and adolescence dealing largely with behavioral disorders and the conditions that dispose toward them (e.g. Patterson, DeBaryshe, and Ramsey, 1989). More recently the social deviance risk literature has included such topics as substance abuse (Newcomb and Bentler, 1989) and teenage pregnancy

Table 1

Risk Literatures	Terms	Ages
1. High Risk Infant	At-risk Biological risk Social risk	Prenatal Neonate Infants
2. Conduct Disorder	Deviant Delinquent Aggressive	Middle Childhood Adolescent
3. Behavioral Tetratogenesis	Specific risk elements: lead methylmercury alcohol, etc.	Animal analogs Infants Preschool Middle Childhood
4. Developmental Psychopathology	Emotionally disturbed Specific syndromes Vulnerable/ Resilient Protective factors	Middle childhood Adolescent
5. Sensitive Periods	Critical, optimal sensitive epochs for environmental events	Animal analogs Infants Adolescents

(Furstenberg, Brooks-Gunn, and Chase-Linsdale, 1989). The deviance, social conduct disorder research areas employ the terms vulnerability and invulnerability, invoke notions of protective agents and buffers and deal largely with social environmental stressors as important variables interacting with constitutional factors.

The third literature is more somewhat more circumscribed to an area referred to as "behavioral teratogenesis" (Vorhees and Mollnow, 1987; Streissguth et al.) where the focus is on infancy and the effect of exposure to environmental agents such as lead, methylmercury, and alcohol prenatally or in the early postnatal years. The risk referents here are largely to the environment though organismic and developmental susceptibility introduce concepts of relative vulnerability. For obvious reasons, the experimental literature is based almost entirely on animal work The typical retrospective or contemporaneous evaluations possible for the human studies have many methodological problems.[1]

The fourth literature relates to developmental psychopathology, focusing largely on the emotional/social domain. This literature overlaps the social conduct disorder literature but the emphasis is more upon psychological dysfunction that involves labels such as "emotionally disturbed" in a range of deviance requiring individual clinical intervention. The age range of interest is typically middle childhood and adolescence. The terms vulnerable, at-risk, stress and resilient along with notions of protective factors and competence reflect acknowledgment of the role of constitutional variables interacting with environmental factors. (Kazdin, 1989; Richters and Weintraub, In Press; Garmezy, Masten and Tellegen, 1984).

Finally, a fifth literature, not typically referenced in the risk literature, is that which deals with sensitive periods (Almi and Finger, 1987; Bateson and Hinde, 1987; Bornstein, 1989). Much of the literature is

based on non-human animals with the analogs to human development variously described. The terms critical period, optimal period, sensitive period are used in conjunction with environmental stimulation matched to organismic receptivity at a particular time during development - most often early development. However, sensitive periods for animals can occur at multiple points across the life span. Thus, there may be a continual renewal of points during development when the absence of particular experiences or particular facilitating environments puts the organism at risk.

These literatures are as obviously diverse as they are conceptually overlapping.

A Developmental Framework for the Concept of Risk

It may be important to try to unify the concepts of risk, at-risk, vulnerable and resilient into a meaningful developmental framework that recognizes all these literatures. The principles described in Table 2 are such an attempt. We have discussed Principles 2 and 3 and some of what is

---

Insert Table 2 about here

---

noted in Principle 4. Principle 1 is critical for a developmental perspective. As noted above, the different risk literatures tend to concentrate either on the infant or on middle childhood and adolescence. The infant literature tends to be concerned more with cognitive and intellectual development, the middle childhood and adolescent literature with social/emotional development.

The emphasis upon infancy stems in part from the influence of Hebb's (1949) assertions about the role of early experience on brain development, and from the notions of greater plasticity early in life. Other

Table 2

A Developmental Framework for

the Concept of Risk

Principles

Principle 1: Risk conditions should be specified in terms of developmental periods.

Principle 2: Risk conditions should be specified with reference to behavioral systems.

Principle 3: Risk conditions should be specified with reference to the Universal and non-Universal behavioral repertoires.

Principle 4: Risk variables should be specified as residing in the organism or in the environment or both with different degrees of mutual influence recognized as a possibility for different behavioral repertoires, different behavioral systems, and in different development periods.

orientations, however, have been suggested (Clarke and Clarke, 1976). The focus upon middle childhood and adolescence is in part driven by the incidence of developmental problems and aberrent behavior during these years.

On the other side of the early experience issue is the argument made by several that the period of infancy is so buffered and overdetermined that environmental variations are of little basic import (Kagan, 1984; Scarr-Salapatek,1976). As has been suggested previously, this analysis is probably correct with respect to the Universal behavioral repertoire but not correct with respect to the non-Universal behavioral repertoire.

An alternative approach may be more reasonable - especially in light of the advances in knowledge in many areas related to development. This alternative approach views each developmental period as having its own matrix of conditions necessary for development with risk factors ever potentially affecting development. Further, the change in the matrix of conditions can become the definition of the nodal points that segment the developmental course - thus a chance for an empirical definition of stage or developmental period. It is assumed, in this approach, that these nodal points do not occur at the same time across behavioral systems nor even for various sub-systems within a larger behavioral system. Table 3 summarizes the implications of this perspective for research. One involves

---

Insert Table 3 about here

---

the matter of how the results of non-developmental studies of risk variables and risk populations are reviewed. Others include the need for multiple assessment of both the organism and the environment, the notion that risk variables exist in the context of a matrix of variables, the importance of

Table 3

Implications for Research

1. Non-developmental study of risk variables and their relation to behavior is important but relevance to developmental outcome requires short and long-term longitudinal research.

2. Risk research aimed at understanding developmental outcome across developmental epochs requires assessment of both the organism and the environment at multiple points in time.

3. Risk factors are embedded in a matrix of variables that affect development. Research needs to be focused on the risk factors in the context of the matrix to understand when and how the risk factors operate to affect development.

4. Individual differences in the context of environments are key variables in whether or not risk factors have adverse effects. Individual differences need to be studied as variables in developmental process.

5. Risk factors can exist and operate at any period of development to affect or change the developmental trajectory of an individual. Continuities and discontinuities in development do not reside in the phenomena of development. They are determined by the processes affecting development. Research on continuities and discontinuities in development needs to focus on the processes that result in continuities and discontinuities.

6. Applied research aimed at prevention and intervention needs to be guided by distinctions related to the Universal and non-Universal behavioral repertoires and to organic and/or environmental sources of risk.

individual differences, the way in which continuity and discontinuity in development is viewed and, finally, the importance of making a distinction between the Universal and non-Universal behavioral repertoire.

With respect to the issue of continuity and discontinuity in development, the point of view adopted here requires that we seek to understand continuity and discontinuity in the context of the processes that produce one or the other rather than in the developmental phenomena themselves. Adopting this kind of process strategy has the potential for going beyond "nature's favorite correlations" toward a significant advance in accounting for the unaccounted variance in developmental outcome.

Such a viewpoint has further implications for putting risk and risk conditions into a consistent framework of developmental dynamics wherein the potential for the individual to be at risk occurs at each nodal point of change in the matrix of conditions affecting development within each behavioral system or sub-system. Such nodal points may be of the nature of "bio-behavioral shifts" (Emde, Gaensbauer and Harmon, 1976) or may reflect developmental periods defined by environmental task demands within a particular society or culture. Individual differences and how they function in process may be different during different periods and in different domains. Development is, therefore, not assumed to be either essentially continuous or discontinuous. Instead of continuity/discontinuity having the status of an assumption it becomes a set of empirical questions. The answers to the questions will have to come from short and long-term longitudinal research investigations that are framed in the context of the effect of risk conditions in a dynamic interplay of process and condition matrices. Or, put more simply, the notion of being at-risk is related to probabilities that are specific to behavioral domains, to developmental period and to the

matrix of organism/environment conditions that are relevant to the behavioral domain at a particular period in developmental time.

This re-evaluation of the concept of risk does not nullify much of the current research on risk. It does suggest, however, that we need to change how we talk about the results of research, how we prognosticate about long term outcome and how we frame our questions about developmental outcome so that they are truly informed by a developmental context that tries to approximate the complexity of the processes responsible for development.

Footnotes

[1]I am indebted to Herbert Gingold for his help in abstracting the recent literature on lead as a risk factor.

References

Almli, C. R. and Finger, S. (1987). Neural insult and critical period concepts. In M. Bornstein (Ed.) Sensitive Periods in Development: Interdisciplinary Perspectives. Hillsdale, N. J.: Lawrence Erlbaum Associates, 123-143.

Bateson, P. and Hinde, R. A. (1987). Developmental changes in sensitivity to experience. In M. Bornstein (Ed.) Sensitive Periods in Development: Interdisciplinary Perspectives. Hillsdale, N. J.: Lawrence Erlbaum Associates, 19-37.

Belsky, J. (1984). The determinants of parenting: A process model. Child Development, 55, 83-96.

Bettes, B. A. (1988). Maternal depression and motherese: Temporal and intonational features. Child Development, 59, 1089-1096.

Bornstein, M. H. (1989). Sensitive periods in development. Psychological Bulletin, 105, 179-197.

Bradley, R. H., Caldwell, B. M., Rock, S. L., Ramey, C. T., Barnard, K. E., Gray, C., Hammond, M. A., Mitchell, S., Gottfried, A. W., Siegel, L., and Johnson, D. (1989). Home environment and cognitive development in the first 3 years of life: A collaborative study involving six sites and three ethnic groups in North America. Developmental Psychology, 25, 217-235.

Clarke, A. M. and Clarke, A. D. B. (1976). Early Experience: Myth and Evidence. N. Y.: The Free Press.

Clarke, A. and Clarke, A. D. B. (1988). The adult outcome of early behavioural abnormalities. International Journal of Behavioral Development, 11, 3-20.

Emde, R. N., Gaensbauer, T. J. and Harmon, R. J. (1976). Emotional expression in infancy. A bio-behavioral study. Psychological Issues, A Monograph Series, Inc. (Vol. 10). N. Y.: International Universities Press.

Emde, R. N., Kligman, D., Reich, J. and Wade, T. (1978). Emotional expression in infancy: I. Initial studies of social signaling and an emergent model. In M. Lewis and L. Rosenblum (Eds.) The Development of Affect. N. Y.: Plenum, 125-148.

Escalona, S. K. (1982). Babies at double hazard: Early development of infants at biological and social risk. Pediatrics, 70, 670-676.

Feldman, D. H. (1980). Beyond Universals in Cognitive Development. N. Y.: Ablex Publishing Corporation.

Field, T. (1987). Affective and interactive disturbances in infants. In J. D. Osofsky (Ed.) Handbook of Infant Development. 2nd Edition. N. Y.: Wiley and Sons, 972-1005.

Furstenberg, F. F., Brooks-Gunn, J., and Chase-Linsdale, L. (1989). Teenaged pregnancy and childbearing. American Psychologist, 44, 313-320.

Garmezy, N., Masten, A. S. and Tellegen, A. (1984). The study of stress and competence in children: A building block for developmental psychopathology. Child Development, 55, 97-111.

Hebb, D. O. (1949). The organization of behavior. New York: Wiley.

Holmes, D. L., Reich, J. N. and Pasternak, J. F. (1984). The Development of Infants Born at Risk. Hillsdale, N. J.: Lawrence Erlbaum Associates Publishers.

Horowitz, F. D. (1978). Toward a functional analysis of individual differences. Presidential address to the Division of Developmental Psychology, American Psychological Association Meeting, Toronto, Canada.

Horowitz, F. D. (1984). The psychobiology of parent-offspring relations in high-risk situations. In L. P. Lipsitt and C. Rovee-Collier (Eds.) Advances in Infancy Research, Vol. 3. Norwood, N. J.: Ablex, 1-22.

Horowitz, F. D. (1987). Exploring Developmental Theories: Toward a Structural/Behavioral Model of Development. Hillsdale, N. J.: Erlbaum.

Hoy, E. A., Bill, J. M. and Sykes, D. H. (1988). Very low birthweight: A long term development impairment? International Journal of Behavioral Development, 11, 37-68.

Kagan, J. (1984). The Nature of the Child. N. Y.: Basic Books.

Kazdin, A. E. (1989). Developmental psychopathology: Current research, issues and directions. American Psychologist, 44, 180-187.

Kopp, C. B. (1983). Risk factors in development. In M. M. Haith and J. J. Campos (Ed.) Infancy and developmental psychobiology. Vol. II of P. H. Mussen (Ed.) Handbook of Child Psychology. N. Y.: Wiley, 1081-1188.

Kopp, C. B. (1987). Developmental risk: Historical reflections. In J. D. Osofsky (Ed.) Handbook of Infant Development. 2nd Edition. N. Y.: Wiley and Sons, 881-912.

Kopp, C. B. (1990). Risks in infancy: Appraising our research. Merrill-Palmer Quarterly (In Press).

Kopp, C. B. and Kaler, S. R. (1989). Risk in infancy: Origins and implications. American Psychologist, 44, 224-230.

Kopp, C. and Krakow, J. B. (1983). The developmentalist and the study of biological risk: A view of the past with an eye toward the future. Child Development, 54, 1086-1108.

Korner, A. F. (1987). Preventive intervention with high-risk newborns: Theoretical, conceptual, and methodological perspectives. In J. D. Osofsky (Ed.) Handbook of Infant Development. 2nd Edition. N. Y.: Wiley and Sons, 1006-1036.

Lubchenco, L. O. (1976). The High Risk Infant. Philadelphia: W. B. Saunders.

Moss, M., Colombo, J., Mitchell, D. W., and Horowitz, F. D. (1988). Neonatal behavioral organization and visual processing at three months. Child Development, 59, 1211-1220.

Newcomb, M. D. and Bentler, P. M. (1989). Substance use and abuse among children and teenagers. American Psychologist, 44, 242-248.

Patterson, G. R., DeBaryshe, B. D. and Ramsey, E. (1989). A developmental perspective on anti-social behavior. American Psychologist, 44, 329-335.

Parrinello, R. M. and Ruff, H. A. (1988). The influence of adult intervention on infants' level of attention. Child Development, 59, 1125-1135.

Ramey, C. and Trohanis, P. L. (1982). Finding and Educating High-Risk and Handicapped Infants. Baltimore: University Park Press.

Richters, J. and Weintraub, S. (In Press). Beyond diathesis: Toward an understanding of high risk environments. In J. E. Rolf, A. Basten, D. Cicchetti, D. Neuchterlein, and S. Weintraub (Eds.) Risk and Protective Factors in the Development of Psychopathology, N. Y.: Cambridge University Press.

Rogoff, B. (In Press). The joint socialization of development by young children and adults. In M. Lewis and S. Feinman (Eds.) Social Influences and Behavior. N. Y.: Plenum Press.

Rutter, M. (1987). Continuities and discontinuities from infancy. In J. D. Osofsky (Ed.) Handbook of Infant Development, 2nd Edition. N. Y.: Wiley and Sons, 1256-1296.

Sameroff, A. J. and Chandler, M. J. (1975). Reproductive risk and the continuum of caretaking casualty. In F. D. Horowitz (Ed.) Review of Child Development Research, Vol. 4. Chicago: University of Chicago Press, 187-244.

Scarr-Salapatek, S. (1976). An evolutionary perspective on infant intelligence. In M. Lewis (Ed.) Origins of Intelligence: Infancy and Early Childhood. N. Y.: Plenum, 165-197.

Schorr, L. B. (1988). Within Our Reach. N. Y.: Anchor Press, Doubleday.

Streissguth, A. P., Barr, H., Sampon, P. D., Darby, B. L. and Martin, D. C. (1989). IQ at age 4 in relation to maternal alcohol use and smoking during pregnancy. Developmental Psychology, 25, 3-11.

Thoman, E., Denenberg, V., Sievel, J., Zeidner, L. and Becker, P. (1981). State organization in neonates: Developmental inconsistency indicates risk for developmental dysfunction. Neuropediatrica, 12, 45-54.

Thompson, L. A. (In Press). Genetic contributions to early individual differences. In J. Colombo and J. Fagen (Eds.) Individual Differences in Infancy: Reliability, Stability and Prediction. Hillsdale, N. J.: Lawrence Erlbaum Associates.

Vorhees, C. V. and Mollnow, E. (1987). Behavioral teratogeneses: Long-term influences on behavior from early exposure to environmental agents. In J. D. Osofsky (Ed.) Handbook of Infant Development. 2nd Edition. N. Y.: Wiley and Sons, 913-971.

Wahler, R. G. and Dumas, J. (1989). Attentional problems in dysfunctional mother-child interactions: An interbehavioral model. Psychological Bulletin, 105, 116-130.